

EPROM BOARDING 3P

Using the John Oliger Expansion System to Create Instant-Load (EPROM) Software for TS/1000 Computers



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Introduction

In last month's article, you were introduced to the John Oliger expansion system kits for the TS-1000/ZX-81 computers. Hopefully, those of you that went out and bought them now want to put them to practical use. Well, that's just what we're going to do.

We will use the system to program 2764 EPROMS. One EPROM will contain a machine code utility (HOT-Z), another will have the "downloading" routine, and the third will be "burned" with the actual demonstration program — "CETCH2" to be downloaded from high memory.

A few words about EPROMS are advisable here. I buy mine new from MICROPROCESSORS UNLIMITED, Route 1, Box 260, Beggs, OK 74421. Note that the 2764 EPROM is manufactured in several "speed varieties" — generally ranging from 200ns to 400ns (nano-seconds). The faster speed varieties (lower numbers) are more expensive. The 300ns speed variety by HITACHI is a good all-around performer, and isn't that expensive. Don't select EPROMS with slower speed ratings (400ns) as these may ultimately prove unusable.

The EPROMS come wrapped in static protection packages, with notes on how to keep them from being accidentally damaged. The advice given by Robert Hartung in CTM (Dec. '84) regarding handling static sensitive devices should also be followed. By being extra careful, you can ensure that your expensive EPROMS have a long healthy life in your projects.

The 2764 EPROM can hold 8192 bytes, or more commonly called "8K". Oliger's 2764 reader board can hold two such EPROMS, for a total program capacity of 16384 ("16K") bytes. If your program is less than "8K", then it can be burned onto a single 2764 EPROM. For programs greater than 8K, but less than 16K, a second 2764 is burned with the continuation of the program. Details for doing this are given in John Oliger's notes.

In addition to the 2764 programmer card, the 2764 reader card, you will also need the 64K dynamic RAM board, and the Vpp programming power supply. The TMS-9918 Video A and Video B boards are optional, however, on the Video B board there is a socket for a 2764 utility EPROM. It is there that we will initially use on our HOT-Z EPROM, and later, our download utility EPROM. It will make your life so much simpler to use the Video A and B boards.

A final note on EPROMS. The 2764's as supplied

from Microprocessors Unlimited are completely erased from the factory, and are ready for programming. Any previously used EPROM must be **completely** erased before programming. Complete erasure is done using a bulk erasing unit. These can be purchased from several companies (DoKay Computer Products) for one and there are others. Typically, they cost about \$75.00. More expensive units with timers aren't necessary. Typical erasing times for my 2764 EPROMS are approximately 45 minutes.

If you are unsure that your EPROMS are completely erased, there is a simple program, "PROMERASE", which you should run to verify this. It is menu driven. Details on how to obtain "PROMERASE" are given at the end of this article.

"HOT-Z" Utility Use

A machine code utility that is practically a must for programming in the Oliger system is Ray Kingsley's "HOT-Z". See previous reviews in SYNC-WARE NEWS (1:4) and SYNTAX QUARTERLY (1:1).

With this utility, you will be able to load in basic programs into high memory (48-64K), then perform the needed and simple analysis on the starting and ending addresses for the peeking and poking required by the 2764 programmer card.

Another vital use of "HOT-Z" is the creation of a utility EPROM to house the machine code download routine. This machine code utility is in "HEX" or hexadecimal, and the "HOT-Z" has a classical "HEX LOADER" routing that is fast and simple to use.

I recommend that you get the version of "HOT-Z" that loads itself into the 8-16K space. You can easily make an EPROM version of "HOT-Z" using the 2764 programmer for instant call-up. This is what we will do next.

III. Programming a 2764 EPROM with "HOT-Z"

First, on your system, make sure that the 8-16K space of the 64K RAM is active. Insert a completely erased 2764 EPROM into the 2764 EPROM programmer card. If you are using the TMS-9918 Video Upgrade, make sure EPROM B on Video Board B is turned off.

Power up your system. Check that the Vpp power supply for the 2764 programmer card is set to its low voltage state (about +5 volts). 1) Check the polarity of the clips. 2) And then connect the clips to the 2764 programmer.

Load in the cassette version of "HOT-Z", which will automatically locate itself into the 8-16K region. Following successful loading, enter the disassembly mode by hitting any key. Then break out of HOT-Z by hitting "Q". You should get the 0/0 cursor to verify this. Now enter the following program by keyboard:

```
10 SLOW
20 FOR N = 8192 to 16383
30 POKE N, PEEK N
40 PAUSE 4
50 NEXT N
60 PRINT "HOT-Z PROGRAMMING COMPLETE"
70 PRINT "TURN VPP TO LOW VOLTAGE AND
DISCONNECT BEFORE TURNING OFF
COMPUTER"
```

Before running the program, make sure Vpp is set at its high (programming) level of +21 volts.

RUN the program. The programming time is approximately 13 minutes, so take a break while you are waiting.

If line 30 seems odd, remember that the contents of RAM in the 8-16K region (HOT-Z) are being transferred to the new EPROM beginning at the same address 8192 and going all the way to 16383. The PAUSE 4 in line 40 is vital to allow the 2764 EPROM time to complete each programming cycle. do not eliminate this step.

Following successful programming, turn Vpp to its low voltage state, then remove the clips from the programmer card, and power down the entire system. Remove the newly-created HOT-Z EPROM and save it for future use. Next, we will program another 2764 EPROM with Oliger's 61 byte machine code downloading utility. This will be used to instantly download programs resident in high memory (on the 2764 READ board).

Programming a 2764 EPROM with MC Downloading Routine

We will use our old friend "HOT-Z" again, this time in its "HEX POKER" or EDIT mode. A 61 byte machine code utility by John Oliger will be entered from C009 (49161d) to C045h (49221d). Then, as before, we shall quit to BASIC and write a simple program to poke the high memory data into the space for EPROM programming.

If you have HOT-Z resident in EPROM B on Video Board B, then just call up RAND USR 8192 to get into the disassembly mode. Otherwise, load HOT-Z in by cassette and proceed accordingly. Also, activate the 48K-64K region of RAM, and have the 2764 programmer card installed with a completely

erased 2764 EPROM.

Once HOT-Z is resident in the 8-16K RAM, enter C009 for the starting address. Enter the HEX-EDIT mode by entering "Y". Hit the "K" switch to obtain the decimal address 49161. Now, following listing below, enter the 61 byte machine code program. Simply key in the HEX numbers as shown in column 2. HOT-Z will automatically jump to the correct address for each HEX number input. When finished, stop by keying in "ENTER" and exiting by keying in "Q". Keying in the HEX program shouldn't take more than about 3 minutes.

Since keying in HEX numbers may be subject to human error, the following simple CHECKSUM program should be run to verify correct HEX data entry:

```
5 REM DOWNLOAD CHECKSUM
10 LET CS = 0
20 FOR N = 49161 to 49221
30 LET D = PEEK N
40 LET CS = CS + D
50 NEXT N
60 PRINT "CHECKSUM = ";CS
```

After running the program, the answer you must obtain is CHECKSUM = 6127. If you get a different answer, then you must repeat the HOT-Z HEX poking procedure.

Having assured yourself that the download MC utility is correctly loaded in high memory, then carefully delete lines 5-60 without NEWing the computer, and proceed to enter the following BASIC program:

```
10 SLOW
20 LET X = 8192
30 FOR N = 49161 to 49221
40 POKE X, PEEK N
50 PAUSE 4
60 LET X = X + 1
70 NEXT N
80 PRINT "PROGRAMMING DOWNLOADING UTILITY COMPLETE"
90 PRINT "NEXT AVAILABLE BYTE = "; X
```

Before running the program, make sure that the Vpp programmer voltage is set to +21 volts. Hit ENTER and the EPROM programmer will perform it's job. Upon completion of the program, the message should be PROGRAMMING DOWNLOAD UTILITY COMPLETE. NEXT AVAILABLE BYTE = 8253. Turn Vpp to its low voltage state and remove clips.

If you have followed everything up to now, there is one final programming sequence to be performed. This is the actual program, "CETCH2", which will be burned into 2764 EPROM. "CETCH2" will demonstrate some features of the advanced video upgrade by John Oliger.

GOTO GOMEZ Pg. 32

FROM English Pg 30

REMs. it was worth the cost of the board to get the program. I had not gotten around to trying Tracy Norris' suggestion of a REPEAT hardware patch and a heavy book (in T- S Horizons,) November 1983.)

Dave English
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FROM GOMEZ Pg. 18

I mentioned previously those of you interested in verifying if your 2764 EPROMS were completely erased could obtain a cassette program to do this. The program is entitled "PROMERASE" and comes with complete instructions. It even gives additional details on how to produce an EPROM version of itself for instant call up. It's available for \$10.00, postage included. Send your check or money order (preferred) to:

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20133 Los Feliz
Thousand Oaks, CA 91362
(to be continued next month as Part III)

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even if you don't know a thing about the machine. This confident approach may fool the computer into thinking you know what you're doing. Anyone working with you will be impressed especially if the computer begins to work as you approach it. Proceed to rule 2 if this approach doesn't work.

2. Take the instruction manual out, making sure the computer sees you doing this. If the computer believes that you have a source of information you will have the upper hand. Continue to step 3 if this approach is not successful.

3. Under your breath, but within hearing of the computer, count to 25 in Hex. If nothing happens, count to 25 in Octal. If neither of these operations works, you will have to move on to the fourth rule.

4. Slap the computer lightly on the side. Everyone knows that a jar will usually cause the computer to work again. Dropping the computer or putting a foot through the monitor is not recommended (you'll probably have to clean up the mess). These last measures are for desperation only. Consult rule number 5 if you have no luck here.

5. Threaten the machine with a large tool, a logic probe, or a long-handled screwdriver. Computers are deathly afraid of the infamous short-circuit. If you still have no positive results, you will be forced to move on to rule six.

6. Burn the entrails of A Tibetan mountain goat on the disk drive of the computer at midnight when there is a full moon. This act will call the mystical powers known to protect computers. Note: this is a drastic step and failure will result in a badly charred disk drive. Take this step only when all other steps, including rule 7, have failed. Another Note: those owning cassette based systems may substitute a cassette recorder for a disk drive so long as proper procedures are followed.

7. If all else fails, be comforted by this fact: 90% of all computer problems are human oriented. In other words, READ THE MANUAL !!

Software Review of the Month

If you haven't had a chance to look at "In Search of the Most Amazing Thing" from Spinnaker, it will be worth your time, especially if you have kids. It's a graphics oriented adventure game that's a lot of fun to play and requires thinking, map skills, reading ability, estimation skills, and general common sense. It's available for a wide variety of computers.

Thanks for the letters, I'll try to answer all of them in time, but I'm a bit behind, so I ask for your patience.

Comments, etc. to
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